

AN ANALYSIS OF MAINTENANCE FOLLOWING FUNCTIONAL COMMUNICATION TRAINING

V. MARK DURAND AND EDWARD G. CARR

STATE UNIVERSITY OF NEW YORK AT ALBANY,
STATE UNIVERSITY OF NEW YORK AT STONY BROOK, AND
SUFFOLK CHILD DEVELOPMENT CENTER

The multiple and long-term effects of functional communication training relative to a common reductive procedure (time-out from positive reinforcement) were evaluated. Twelve children participated in a functional analysis of their challenging behaviors (Study 1), which implicated adult attention as a maintaining variable. The children were then matched for chronological age, mental age, and language age and assigned to two groups. One group received functional communication training as an intervention for their challenging behavior, and the second group received time-out as a contrast. Both interventions were initially successful (Study 2), but durable results were achieved only with the group that received functional communication training across different stimulus conditions (Study 3). Students whose challenging behaviors were previously reduced with time-out resumed these behaviors in the presence of naive teachers unaware of the children's intervention history. The value of teaching communicative responses to promote maintenance is discussed as it relates to the concept of functional equivalence.

DESCRIPTORS: functional analysis, maintenance, communication, disruptive behavior, aggression

Recent work on interventions for challenging behavior has focused on a return to our behavioral roots, namely an understanding of and reliance on the ideographic and functional nature of such behavior (Carr, Robinson, & Palumbo, 1990; Durand, 1987; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). As knowledge of the variables controlling such behaviors as self-injury and aggression has expanded, so too has the use of this information to build individualized interventions. Researchers in this area have designed strategies to reduce challenging behavior that involve teaching functionally equivalent behaviors (e.g., Carr & Durand, 1985; Doss & Reichle, 1989; Durand &

Carr, 1991; Horner & Budd, 1985; Wacker et al., 1990), altering stimulus conditions or setting events (e.g., Gaylord-Ross, Weeks, & Lipner, 1980; Touchette, MacDonald, & Langer, 1985), and using response covariation (e.g., Meyer, Evans, Wuerch, & Brennan, 1985; Parrish, Cataldo, Kolko, Neef, & Egel, 1986).

The teaching of functionally equivalent responses involves, at the most basic level, an analysis phase that assesses the variables maintaining the target behavior. This is followed by an intervention phase that provides the same consequences for a different behavior, along with withholding those consequences for the challenging behavior. It is assumed that if individuals can gain access to desired consequences at a higher rate and/or more efficiently with the new response, they will increase their use of this new response, thereby reducing their use of the undesirable response. One intervention strategy that uses communication as the functionally equivalent response has been called *functional communication training* (FCT) (Carr & Durand, 1985; Durand, 1990).

Research on FCT has examined the effectiveness of this approach with severe aggression and self-

We thank Daniel Crimmins, Paul Doss, Wendy Durand, Eric Goode, and Russ Whitehurst for their input. The contents of this paper were developed under grants from the U.S. Department of Education to the first author (H133C90182, H086G00005, H029K00074), and by Cooperative Agreement G0087C0234 to the second author. The contents do not necessarily represent the policy of the Department of Education, and endorsement by the federal government should not be assumed.

Correspondence regarding this manuscript should be addressed to V. Mark Durand, Department of Psychology, State University of New York, 1400 Washington Avenue, Albany, New York 12222.

injurious behavior (e.g., Bird, Dores, Moniz, & Robinson, 1989; Durand & Kishi, 1987), stereotyped behaviors (e.g., Durand & Carr, 1987; Wacker et al., 1990), and a variety of other disorders (e.g., Carr & Kemp, 1989; Durand & Crimmins, 1987; Mace & Lalli, 1991). The interventions have been conducted in group homes (e.g., Durand & Kishi, 1987), schools (e.g., Hunt, Alwell, Goetz, & Sailor, 1990), and vocational settings (e.g., Bird et al., 1989). Research on FCT has also included work on maintenance (e.g., Bird et al., 1989; Durand & Carr, 1991) and response efficiency (Horner, Sprague, O'Brien, & Heathfield, 1990).

Although generally positive results have been reported by different research teams, the boundaries of this intervention are just now being explored (Durand & Carr, 1991). For example, the multiple and long-term effects of FCT need further analysis. It is possible that FCT may generalize to other environments because the communicative responses recruit "natural communities of reinforcement" (Durand, 1987, 1990). The process of recruiting natural communities of reinforcement was outlined by Baer and Wolf (1970) and refers to behaviors that evoke positive consequences from those in the environment without explicit training. For example, Stokes, Fowler, and Baer (1978) taught young children to cue their teachers to provide praise for their work. By saying phrases such as, "Look at how much I've done," the children were successful in getting their teachers to respond with positive comments (e.g., "That's very good").

In the present context, it was hypothesized that a response could be taught to evoke the desired consequence from others in the environment without specifically training these other people. For instance, if a student exhibits challenging behavior to gain adult attention, then the child can be taught an alternative attention-getting response. At the same time, if the new response can be easily recognized as a request for attention, then adults would not need formal training on how and when to respond to the child. The effects of the intervention should generalize to the extent that persons unfamiliar with the student or the student's history are

able to respond appropriately (i.e., provide social attention). In contrast, this is not the case for other techniques. For example, unfamiliar adults would not be expected to implement time-out from positive reinforcement without explicit training.

The present study was designed to assess the ability of FCT to reduce attention-maintained challenging behavior and to be maintained with untrained persons. For comparison, a second group of students was exposed to time-out from positive reinforcement as a consequence for their behavior. It was anticipated that this intervention would also be effective for treating attention-maintained behavior, but that the effects would not be maintained with new teachers who were unaware that a time-out contingency was in effect. That is, we assumed that even teachers who were familiar with students displaying challenging behavior would not implement time-out on their own, and therefore the reductions would not generalize to these new people.

STUDY 1

Method

Participant selection. Participant selection occurred in a two-step procedure at a school for children with developmental disabilities. A problem behavior checklist was administered to teachers; all children who exhibited frequent challenging behavior in their classrooms (i.e., more than once per hour) were identified as potential participants. Next, the Motivation Assessment Scale (MAS; Durand, 1990; Durand & Crimmins, 1992) was completed by the teachers for all of those children identified as frequently disruptive. Children who exhibited behaviors with the highest mean score on the MAS in the social attention category were considered for inclusion.

Participant description and setting. A total of 66 children were identified as exhibiting frequent behavior problems. Of these children, 19 (29%) exhibited attention-getting behaviors, as defined by the MAS. Twelve participants for this study were selected randomly from these 19 children. Table 1 shows the characteristics of these children.

Table 1
Characteristics of Participants

Student	Gender	Chronological age (months)	Mental age ^a (months)	Language age ^b (months)	Behavior topography ^c	Diagnosis ^d
Time-out group						
Wendy	Female	48	32	13	AGG, OP, TAN	MR-M
Mark	Male	56	35	38	AGG, TAN, DP	MR-M
Jonathan	Male	46	47	46	DP	IA
Dan	Male	61	64	50	TAN, DP	ADD
Brian	Male	51	51	30	OP, TAN, DP	ADD
Paul	Male	59	29	36	OP, TAN, DP	IA
<i>M</i>		53.5	43.0	35.5		
FCT group						
Jaynie	Female	56	53	22	OP, TAN	IA
Sam	Male	62	49	48	TAN, DP	MR-B
Ted	Male	42	28	29	OP, TAN, DP	DLD
Ian	Male	59	48	37	OP, TAN, DP	DLD
Ray	Male	40	33	18	AGG, TAN, DP	DLD
Mike	Male	60	49	51	TAN	DLD
<i>M</i>		53.2	43.3	34.2		

^a Mental age for each student was determined using the Stanford-Binet Intelligence Test

^b Language age was determined from the Gesell Expressive Language Scale.

^c AGG = aggression, OP = opposition, TAN = tantrums, DP = destroying property.

^d MR = mental retardation, M = mild, B = borderline, IA = infantile autism, ADD = attention deficit disorder, DLD = developmental language disorder.

All sessions were conducted in a room (2 m by 5 m) adjacent to the children's classrooms. The room contained a table and chairs for the trainer and children. Three undergraduate psychology majors served as trainers in this and subsequent studies. Each trainer had at least one semester's experience in a classroom working with children with developmental disabilities.

Procedure and design. This study replicated previous work and was also used to substantiate the MAS (e.g., Durand & Carr, 1987, 1991). Three experimental conditions (baseline, attention, demand) were introduced in an ABACA design (Barlow & Hersen, 1984) to assess the influence of adult attention and difficult task demands on the children's problem behaviors. A preassessment phase was used to select the task materials for the assessment conditions. The task materials were constructed from pictures adapted from the Leiter International Performance Scale (Leiter, 1969) and were individually selected to provide an "easy" set of pictures (a pool of items on which the child

could answer approximately 100% correct) and a "difficult" set (approximately 33% correct responses).

Baseline. Ten-minute sessions of baseline were presented to each child, two or three times per day. There was at least a 10-min break between all sessions for all three studies. During these and all subsequent sessions, each child was required to complete the match-to-sample task assessed as easy (100% correct responding) in the preassessment phase. The match-to-sample task consisted of a series of cards (7.5 mm by 12.5 mm) on which pictures were pasted. Each child was given a stack of these pictures and was asked to match them to several samples placed in front of him or her.

Correct answers on these tasks were praised (e.g., "Good work") on approximately a variable-ratio (VR) 3 schedule (the occasional incorrect response was followed by the statement, "No, that's not correct"). The VR 3 schedule resulted in praise occurring in 33% of the intervals. This ratio of reinforcement was chosen to be comparable to the

rates of reinforcement in the subsequent conditions (i.e., attention and demand). A 100% level of verbal attention was achieved by including a comment in one third of the intervals, a praise statement in a different third, and a neutral comment in the remaining third. The presentation of commands to complete the task was paced (approximately one every 30 s) to match the rate of presentation in the subsequent conditions. This resulted in praise during 33% of the 10-s scoring intervals (i.e., 20 of 60 intervals). A 100% level of verbal attention (i.e., some form of verbal attention in each 10-s scoring interval) was accomplished by the addition of neutral comments (e.g., "It's a nice day out today") in the remaining 33% of the intervals. Subsequent experimental conditions were constructed by manipulating either task difficulty or the distribution of verbal attention without changing the number of praise statements, task demands, or neutral comments.

Attention. This condition was designed to assess changes in the participants' challenging behavior as a function of changing the distribution of verbal attention (i.e., increasing the time between periods of attention). The length of sessions (10 min) and the tasks were identical to those in baseline (i.e., the "easy" stimuli were used). During this condition, the total amount of commands, praise statements, and comments was the same as in baseline. What differed, however, was the scheduled delivery of these statements.

During attention, the trainer sat facing away from the child during most of the session while the child worked independently. For approximately 33% of the scoring intervals (20 of 60 10-s intervals), the trainer turned to the child, praised correct responses (e.g., "That's right"), presented a task-related command (e.g., "Which one is the church?"), and provided a neutral comment (e.g., "All of the cards are white"). Thus, the overall distribution of verbal attention was reduced from the baseline level of 100% to only 33% of the intervals. Occasional incorrect responses were followed by the phrase, "No, that's not right," or its equivalent. This procedure resulted in correct responses being reinforced on approximately a VR 3

schedule. This rate was equivalent to the number of praise statements presented in baseline.

Demand. This last condition was an assessment of the effects of a more difficult task on the children's behaviors. As in baseline and attention, each session was 10 min long, and the children were required to complete the academic task. The task materials for demand, however, were selected from the pictures on which each child could only answer approximately 33% correct (i.e., a difficult task).

The accuracy rate for each child was monitored by the trainer during the session. An increased number of items from the easy stimulus materials was introduced during the next session if the child was responding at less than 33% correct. Similarly, more items from the difficult pool were added if the child was above 33%. Because of the large number of items used, the children did not learn many of the discriminations. The pool of items used for each child, therefore, remained constant throughout the assessment.

In addition to the more difficult task materials, the other difference in procedure from baseline was the schedule of reinforcement. Correct answers to questions in this condition were reinforced on approximately a continuous schedule of reinforcement (CRF). Because there were approximately two-thirds fewer correct responses, a CRF schedule resulted in an approximately equivalent number of praise statements compared to the other conditions.

Response Definitions

Challenging behavior. Four categories of challenging behavior were identified. *Aggression* was defined as hitting others or pulling hair. *Opposition* involved pushing away task materials or saying "no" to requests. *Tantrums* included any loud vocalizations or screaming accompanied by whining or crying. *Destruction of property* was defined as ripping, striking, or knocking over objects. Instances of each behavior were recorded as either present or absent in each 10-s scoring interval. The percentage of scoring intervals in which problem behavior was observed was calculated for each session.

Academic responses. Correct responses on the

match-to-sample task were recorded for each card that was correctly placed on a matching card. Incorrect responses were recorded for each card placed on the wrong sample card or if the child did not respond within 10 s. Percentage of correct responses for this task was calculated by taking the number of correct responses and dividing it into the total number of correct plus incorrect responses and multiplying by 100.

Trainer responses. Several trainer responses were recorded to assess procedural reliability. *Praise* was recorded whenever the trainer provided approval for some aspect of the child's behavior (e.g., "Nice sitting," "That's right"). *Commands* included any task-related statement or question made by the trainer (e.g., "Point to the comb," "Put that on the picture of the horse"). *Comments* were recorded for statements that were neither commands nor praise (e.g., tacts such as "This is a pretty picture"). *No response* was recorded for those 10-s intervals in which no trainer responses were observed.

Data Collection and Interobserver Agreement

Data for all studies were collected by undergraduate psychology majors. Observers recorded both child and trainer responses. One advanced undergraduate served as a standard from which to assess interobserver agreement and was present at least once during each condition. Interobserver agreement data were assessed in 67% of the sessions and were computed as the number of agreements divided by the number of agreements plus disagreements. The mean agreement score was 78% or higher for all participants and response categories (range, 78% to 100%).

Procedural reliability data. For baseline, the mean percentage of correct responses observed across the 12 children was 97.9%. For attention, the mean was 97.6%, and for demand, it was 33.8%. These percentages approximated those anticipated for each condition. Praise occurred at an average of 33.2% for baseline, 32.5% for attention, and 32.7% for demand. Commands occurred at an average of 33.4% for baseline, 32.0% for attention, and 33.8% for demand. Similarly, comments occurred at an average of 32.9% for baseline, 32.8% for attention,

and 32.7% for demand. The mean percentage of intervals with some form of attention was 98.2% for baseline, 33.5% for attention, and 98.7% for demand. Therefore, praise, commands, and comments appear to have occurred at equivalent levels across all experimental conditions.

Results and Discussion

Figures 1 and 2 show the percentage of intervals of challenging behavior for the 12 children. Challenging behavior was most frequent in the attention condition. The mean percentage was 3.5% for baseline, 47.7% for attention, and 4.6% for demand. These findings lend support to the assumption that the challenging behaviors were maintained by adult attention.

STUDY 2

Based on the findings of Study 1, two forms of treatment were selected for comparison. Functional communication training involved providing the child with an alternate but appropriate attention-getting behavior and was hypothesized to result in reduced challenging behaviors. Time-out from positive reinforcement involved removing attention as a consequence for attention-getting behavior and was also hypothesized to reduce this behavior.

Method

Participant assignment. The participants identified in Study 1 as exhibiting disruptive attention-getting behavior participated in Study 2. The children were assigned to two groups, matched for language age, mental age, and chronological age. Mental age was determined from the Stanford-Binet Intelligence Test (Terman & Merrill, 1973), administered by graduate students in psychology not associated with the present study. Language age was determined from the Gesell Expressive Language Scale (Gesell, 1949), administered by speech pathologists associated with the children's school. Once the two groups of children were formed, a coin flip was used to decide which group received time-out or FCT.

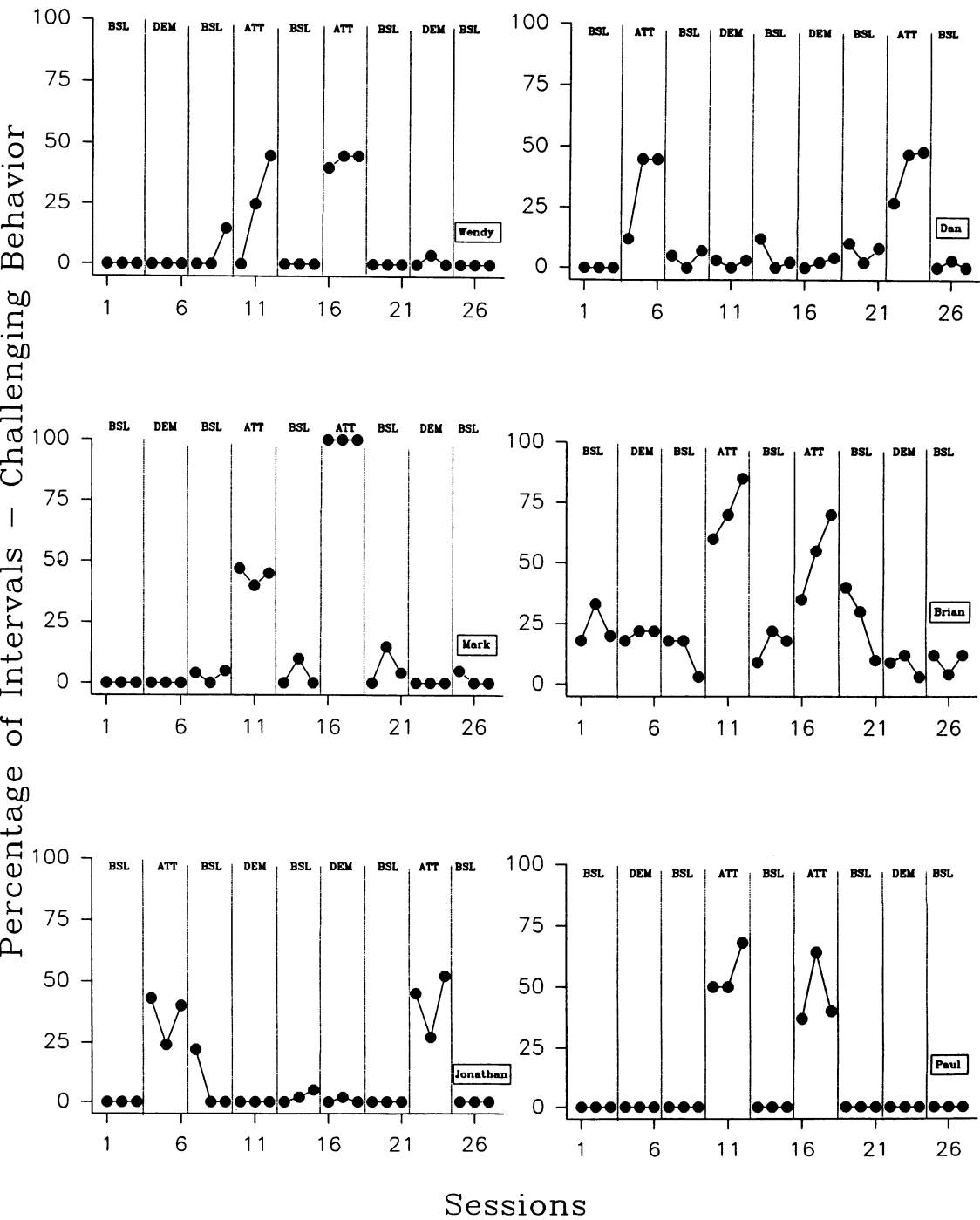


Figure 1. Challenging behavior for each of the participants in the time-out group as a function of the assessment manipulations in Study 1.

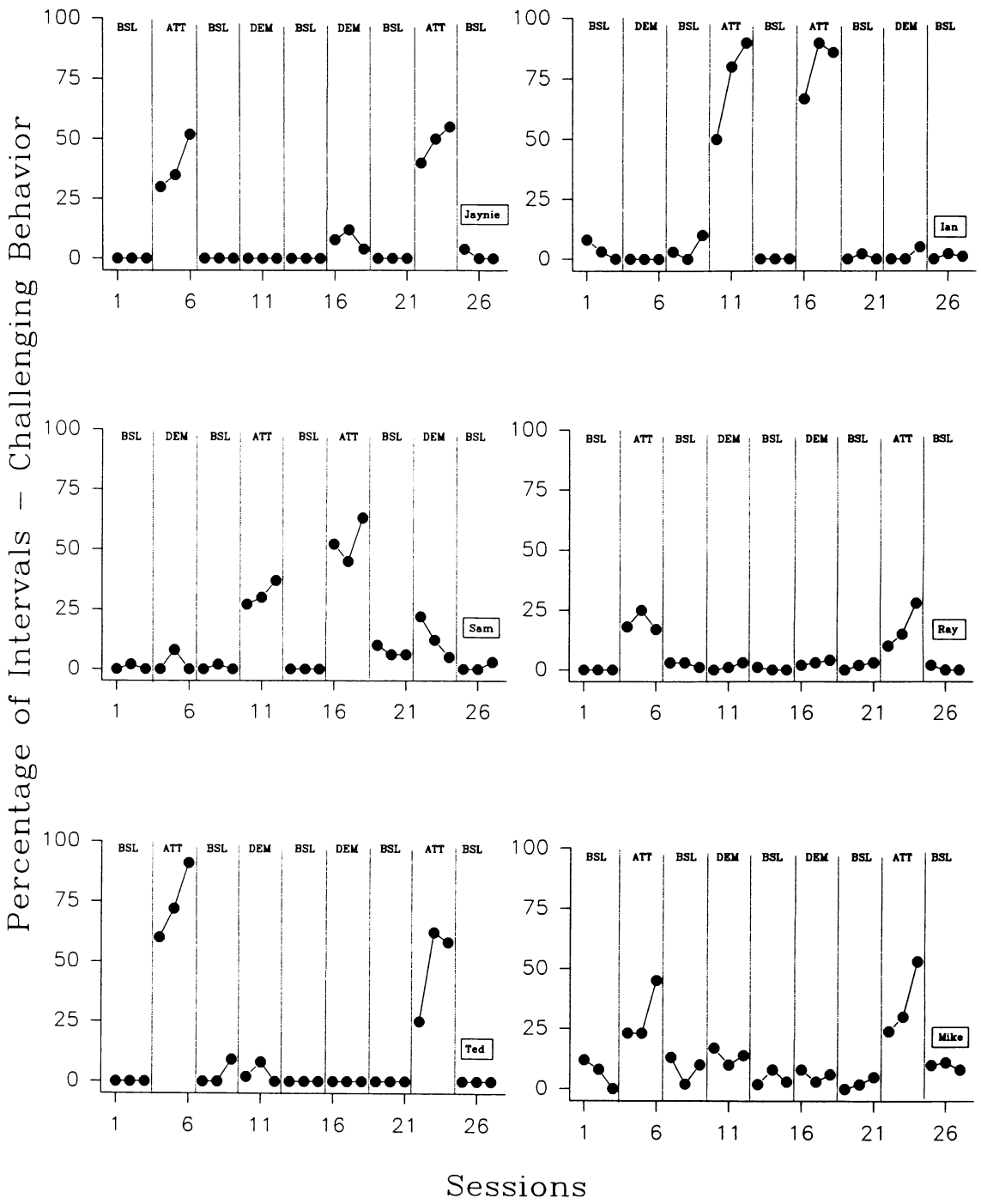


Figure 2. Challenging behavior for each of the participants in the FCT group as a function of the assessment manipulations in Study 1.

Experimental Design and Procedures

Treatment was introduced in a multiple baseline design (Barlow & Hersen, 1984).

Baseline. Baseline was identical for all children and involved the same procedures as the attention condition described in Study 1. The children were required to complete the easy match-to-sample task during each 10-min session and were praised for correct responses approximately every 30 s. As in the attention condition, for every three recording intervals, two involved no verbal attention and the third contained an instance of praise, a task-related command, and a neutral comment.

Functional communication training. Prior to the FCT intervention sessions, children in this group were trained to request attention from the trainer through verbal responses (e.g., "Am I doing good work?"). Training proceeded through several stages, as detailed elsewhere (Durand, 1990).

The first stage involved verbal imitation. The trainer sat across from the child with the match-to-sample cards on the table between them. The trainer turned to the child and repeated "Say, 'Am I doing good work?'" Correct approximations were followed with praise (e.g., "Yes, you are doing very good work; that's nice asking"). Training in verbal imitation continued until the child correctly imitated the attention-getting phrase 10 consecutive times. The second stage involved fading the verbal prompt to only a head turn by the trainer. The phrase "Say, 'Am I doing good work?'" was shortened over training trials to approximations such as "Say, 'Am I.'" This fading continued until the child was correctly responding with "Am I doing good work?" when the adult simply turned toward the child.

The next stage proceeded by increasing the time between head turns (e.g., 1 to 5 s) in order to encourage independent requesting. If the child independently requested attention (i.e., before the adult turned towards the child), then the adult praised the child. When the student produced 10 independent requests for attention in a session, training continued to the final stage.

This last stage was carried out if the child con-

tinued to repeat the trained phrase more than approximately once every 30 s. Two of the 6 students in this group required this training. Requests that came less than 5 to 10 s apart were not responded to, whereas less frequent requests were praised (differential reinforcement for low rates; DRL). This period was gradually lengthened until it approximated one request per 30 s, the same rate at which praise was presented in baseline. Training the children in FCT was relatively brief, averaging 18 min (range, 5 to 45 min) across all 6 children.

Once training was completed, each child in this group participated in a procedure similar to baseline. Sessions were 10 min long. The children were presented with the easy match-to-sample task, and approximately every 30 s the trainer turned to the child, presented a task command (e.g., "Let's do some more work"), and provided a comment (e.g., "There are a lot of cards on the table"). The trainer praised the children if they responded correctly to the task or if they requested attention (i.e., "Am I doing good work?"). The trainer withheld praise for correct responses if the child independently uttered the attention-getting phrase ("Am I doing good work?"). The trainer kept track of the intervals by means of a tape recorder that signaled the 10-s intervals. If a child requested attention at a rate of less than once per 30 s, the trainer presented a command and a comment on schedule (i.e., every 30 s) and praised the child for a correct answer.

This procedure resulted in each child working independently for approximately 20 s. The child was attended to when he or she uttered the trained phrase, although the amount of verbal attention (praise, commands, comments) remained the same as in baseline. The only difference between intervention and baseline was that now the child initiated interactions with the trainer. All challenging behaviors in these sessions were ignored, as in baseline.

Time-out from positive reinforcement. Before the time-out procedure was introduced to the second group of children, each child participated in imitation training. Because the children in the FCT group received approximately 18 min of training on the attention-getting phrase, each child in the

time-out group received approximately 18 min of imitation training (range, 12 to 25 min) to control for the attention received by the FCT group. The goal of this imitation training was to teach these children to imitate a phrase (e.g., "My name is Billy") without an increase in attention (i.e., teachers did not routinely respond to this phrase with praise).

Once this training was complete, the children in the time-out group participated in 10-min intervention sessions similar to baseline. The difference between baseline and intervention for this group was that during intervention, a time-out procedure was used. If a child exhibited a challenging behavior, the trainer immediately removed the task materials from the table and turned away from the child for 10 s. No interactions occurred between the child and the trainer during this time. Also, observers were instructed to interrupt recording during time-out so that data for the session did not include the time-out period. The session resumed following the end of the time-out period (i.e., the task materials were replaced). This resulted in 10 min of work time (i.e., 10 min plus the time-out). If a child exhibited a challenging behavior immediately following the end of a 10-s time-out, the task materials were again removed and the trainer turned away. When the child was not in a time-out period, the easy match-to-sample task was presented as in baseline.

Response definitions and observer agreement. Challenging behavior, task performance, and trainer responses were recorded using the definitions and procedures described in Study 1. In addition, the trained attention-getting response taught to the FCT group was recorded if it occurred without prompting. This response was recorded for both groups during baseline and intervention.

Interobserver agreement was assessed in 65% of the sessions and was measured as in Study 1. The mean interobserver agreement was 85% or greater for all response categories.

Procedural reliability data. We expected task performance for the 12 children to approximate 100% correct responding and not to differ between baseline and intervention. The mean percentage of

correct responses during baseline was 97.4% for the time-out group and 96.9% for the FCT group. Similarly, percentage of correct responses averaged 96.7% for the time-out group and 97.8% for the FCT group during intervention.

The mean percentage of no trainer response during baseline was 65.5% (34.5% attention) for the time-out group and 64.4% (35.6% attention) for the FCT group. There was no difference in the mean percentage of no response for intervention, with both groups averaging 64.7% (35.3% attention). Thus, the overall amount of attention received by the children was equivalent across conditions and between treatment groups.

The mean percentage of intervals of praise during baseline was 33.0% for the time-out group and 33.4% for the FCT group. The mean percentages were identical at 32.6% for praise for both groups during intervention. The mean percentage of intervals of commands during baseline was 33.2% for the time-out group and 33.3% for the FCT group. The mean percentage during intervention was 32.6% for the time-out group and 33.3% for the FCT group. The mean percentage of intervals of comments during baseline was 32.8% for the time-out group and 33.3% for the FCT group. The means were identical at 33.2% for both groups during intervention. The attempt to keep the levels of praise, commands, and comments at approximately 33% was successful.

Results

Unprompted communication. The mean percentage of unprompted communication (i.e., "Am I doing good work?") for both the time-out and FCT groups during baseline was 0%. Following intervention, the children from the FCT group emitted the trained response in an average of 13.9% of the intervals. None of the children from the time-out group emitted the phrase (or any appropriate variations) during intervention.

Effects on challenging behavior. The mean percentage of intervals of challenging behavior was similar for both treatment groups during baseline. The mean for the children in the time-out group was 49.1%, and was 59.6% for the children in the

FCT group. Both treatments were successful in reducing the rate of challenging behavior. The mean for the time-out group after intervention was 8.0%, and was 5.2% for the FCT group. Figures 3 and 4 provide the individual multiple baseline data for the children from both groups.

Discussion

The success of time-out as a treatment for attention-getting challenging behavior appeared to involve the removal of adult attention as a consequence for these behaviors. The time-out procedure may be more successful than similar techniques (e.g., extinction) because the termination of attention is typically accompanied by a salient stimulus (e.g., removal of child, turning away by the adult). Although part of the success of time-out may be attributed to its saliency, saliency may also account for the lack of generalization often observed with this technique (Harris & Ersner-Hershfield, 1978). What signals the child that the procedure is in effect (i.e., head turn and removal of materials) may, in its absence, also signal when the procedure is not in effect.

The FCT technique appeared to have been successful in reducing challenging behavior by providing the children with an alternative attention-getting response. Challenging behavior during these sessions was followed by response-independent consequences (Durand, 1990). In other words, the children's behavior problems were treated as if they did not exist. If the trainer was about to praise a child, for example, and the child became aggressive, praise was still delivered. Therefore, challenging behavior was intermittently followed by attention. The success of FCT appears to involve providing an alternative with a greater likelihood of being reinforced. The child is then left with the choice of engaging in a behavior that is only occasionally followed by attention (challenging behavior) versus one consistently followed by attention (trained response).

Unprompted communication occurred at a relatively low rate during FCT. This replicated previous observations (e.g., Bird et al., 1989; Durand & Carr, 1991) that many students do not use the

new, functionally equivalent response at rates comparable to their high-rate challenging behavior. One explanation is that the students could gain access to attention with several responses (e.g., correct answers, unprompted communication). Several additional factors affecting the rate of unprompted communication may involve satiation and reinforcer scheduling (Durand, 1990). In other words, the students may have had the opportunity to get as much attention as they wanted, *when* they wanted. Further analysis of this unanticipated finding warrants future research.

STUDY 3

Method

Participants and setting. These were the same as in Study 2.

Experimental design and overview. This study sought to determine whether the response suppression evident with both time-out and FCT would be maintained with trainers who were naive to the children's intervention history. To assess these hypothesized effects, three conditions (naive trainer, trainer, and FCT) were introduced to the children for three sessions each in an ABABAC design (Barlow & Hersen, 1984). Session length was always 10 min, and one to three sessions were conducted per day.

Naive trainer. These trainers were selected from a pool of undergraduate psychology majors who had at least one semester of experience working with children displaying developmental disabilities and who had completed a course in behavioral training techniques. One undergraduate served as the naive trainer for half of the children in each group, and the other served as the trainer for the other half.

The naive trainers were instructed to conduct academic sessions with the children in the same manner as baseline in Study 2. The naive trainers, however, were not instructed in how to respond to challenging behaviors. If they asked for advice on how to react to disruption, they were told, "Do the best you can. Handle it the way you think best." No information was given as to the type of

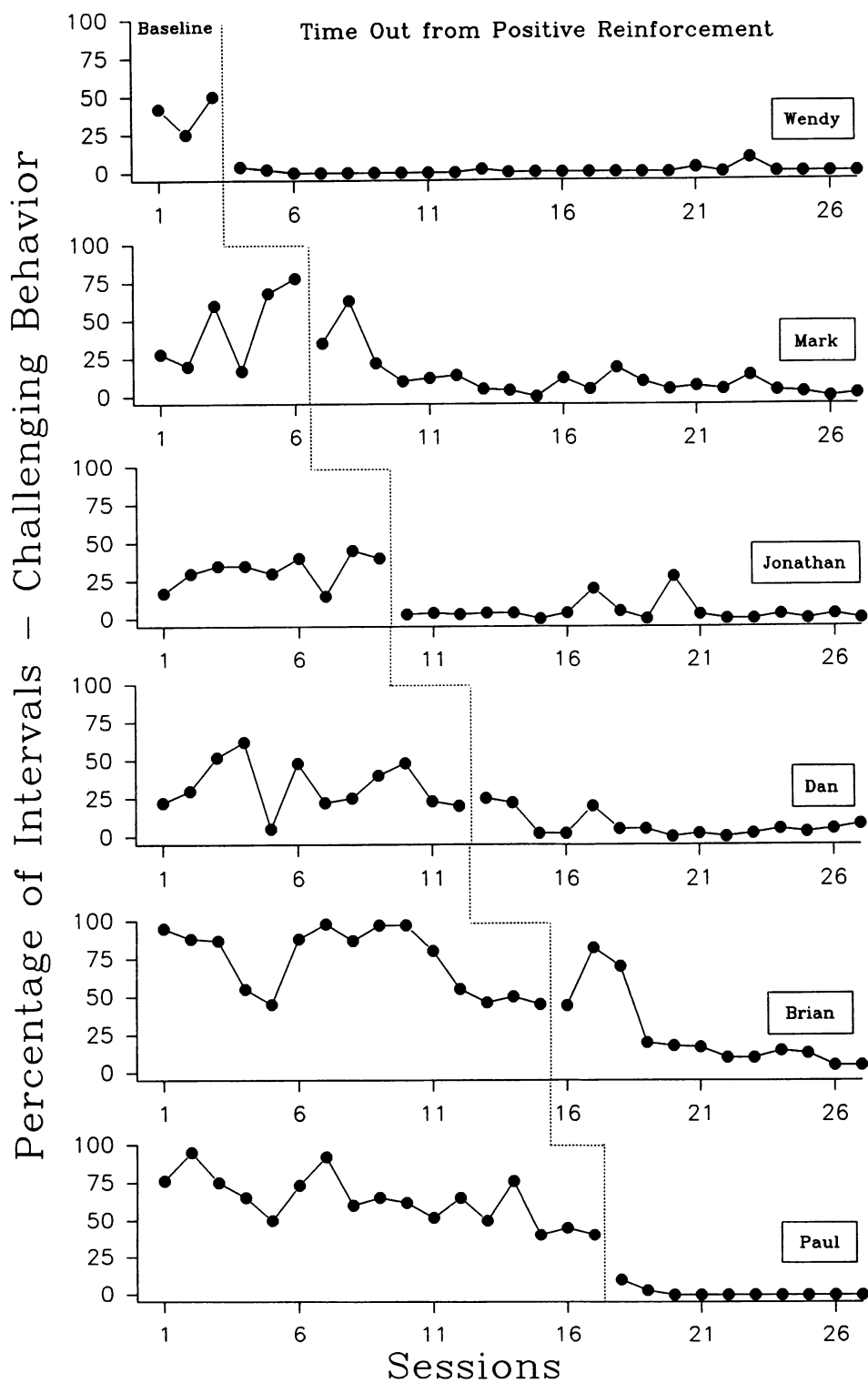


Figure 3. Challenging behavior for each of the participants in the time-out group as a function of the intervention in Study 1.

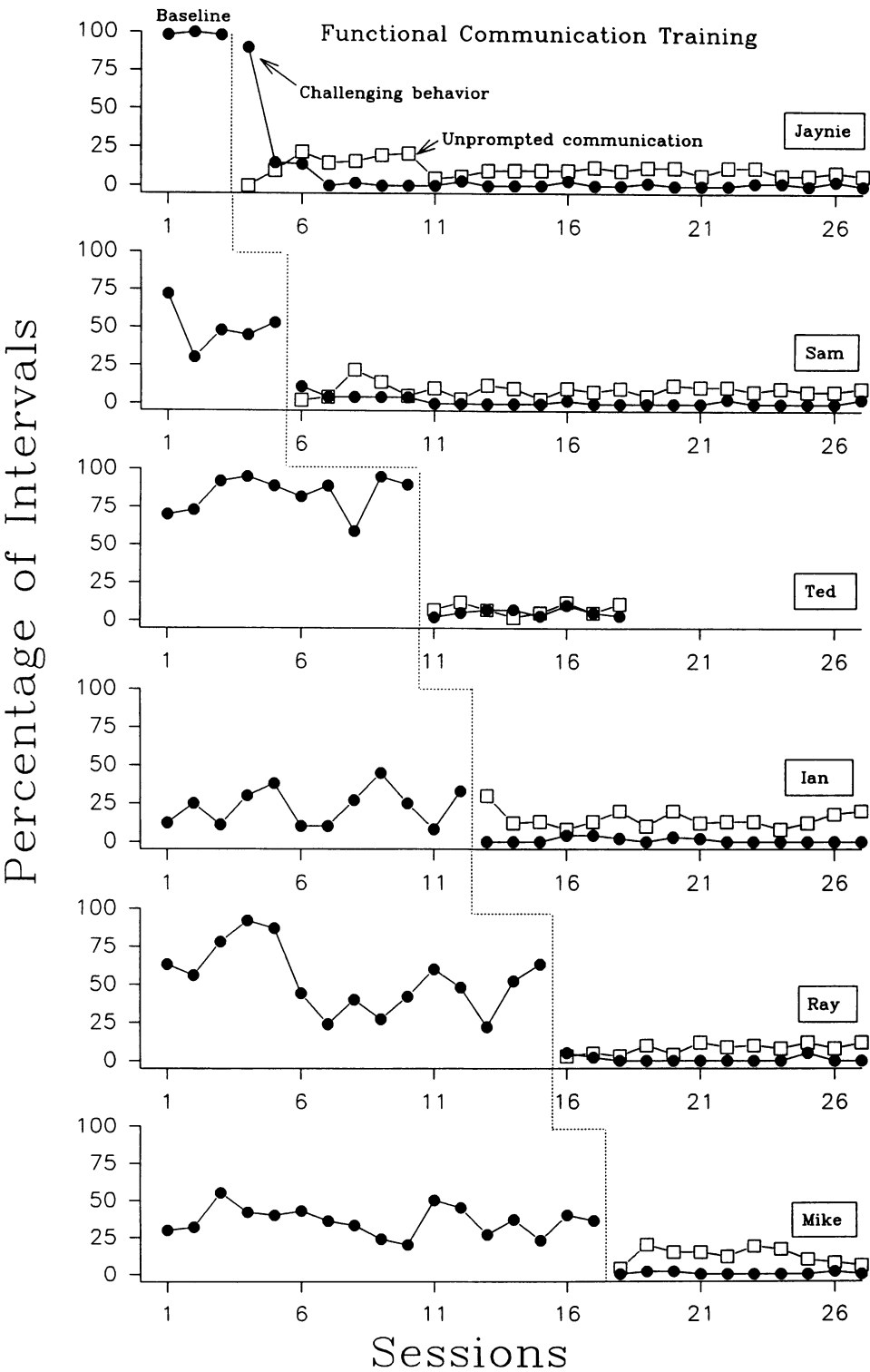


Figure 4. Challenging behavior and unprompted communication for each of the participants in the FCT group as a function of the intervention in Study 2.

intervention used with a specific child in the previous conditions. Three sessions of the naive trainer condition were conducted prior to the intervention sessions in Study 2. These sessions acted as a baseline from which to compare the children's behavior in later naive trainer sessions following intervention.

Trainer. All procedures during these sessions were identical to intervention in Study 2 and were carried out by the trainers from Studies 1 and 2. Three sessions of this condition were conducted following the preintervention session with the naive trainer. After these sessions, the children were again placed in three sessions with the naive trainer. This order was then repeated until the ABABAB design was complete (naive trainer = A, trainer = B) for the FCT group.

FCT. Following the last three sessions of the naive trainer condition, children in the time-out group received three sessions of FCT (resulting in an ABABAC design, where FCT is C). The children from the time-out group received training in FCT for two reasons. First, because FCT was as effective at reducing challenging behaviors as time-out and also taught the children a useful skill (i.e., appropriate attention-getting behavior), it was seen as clinically desirable to train all of the children in FCT. Second, this method provided a means of determining whether the FCT procedure would indeed be effective in reducing challenging behaviors for these children.

Response definitions and interobserver agreement. Recording procedures in Study 3 matched those of Study 2. Challenging behavior, task performance, unprompted communication ("Am I doing good work?"), and trainer responses (praise, commands, comments, and no responses) were recorded using the definitions described in the previous two studies. Interobserver agreement was assessed in 68% of the sessions conducted for each child, and was measured and calculated as in Studies 1 and 2. The mean interobserver reliability was 85% or greater for all response categories.

Procedural reliability data. The mean percentage of correct responses for the 6 children in the time-out group was 97.2% for the three naive trainer phases, 97.9% for the two trainer phases,

and 98.1% for the FCT phase. Similarly, the mean percentage of correct responses for the 6 children in the FCT group was 97.4% for the three naive trainer phases and 97.5% for the trainer phases. These data confirmed that an easy task was presented during all conditions and across both groups.

The mean percentage of no responses for the time-out group was 65.5% (34.5% attention) for the three naive trainer phases, 65.3% (34.7% attention) for the two trainer phases, and 66.2% (33.8% attention) for the FCT phase. Similarly, the mean percentage of intervals with no responses for the FCT group was 65.4% (34.6% attention) for the three naive trainer phases and 65.2% (34.8% attention) for the three trainer phases. Thus, the overall amount of attention was equivalent across conditions and between groups.

The mean percentage of praise for the time-out group was 32.5% for the three naive trainer phases, 32.0% for the two trainer phases, and 32.5% for the FCT phase. The mean percentage of praise for the FCT group was 32.6% for the three naive trainer phases and 32.4% for the three trainer phases. The mean percentage of commands for the time-out group was 32.3% for naive trainer phases, 32.4% for trainer phases, and 32.4% for FCT. The mean percentage for the FCT group was 32.6% for naive trainer phases and 31.9% for trainer phases. The mean percentage of comments for the time-out group was 32.0% for naive trainer phases, 32.1% for trainer phases, 32.5% for naive trainer phases following intervention, and 32.5% for FCT. The mean percentage for the FCT group was 32.5% for naive trainer phases and 32.8% for trainer phases.

Results

Unprompted communication. The mean percentage of unprompted communication observed in the naive trainer phase prior to intervention was 0% for both groups. In the trainer phase, the mean percentage for the time-out group was 0%, whereas the mean was 14.5% for the FCT group. In the naive trainer phases following intervention, the mean percentage for time-out was again 0%, but now the FCT group was 14.4%. Finally, following training in FCT, the time-out group showed a mean

percentage of 15.1% for trained responses. These data indicated that the children from the FCT group used their trained attention-getting response with the new trainers without specific training.

Effects on challenging behavior. The mean percentage of challenging behavior in the naive trainer condition prior to intervention was 61.1% for time-out and 45.9% for FCT. With the introduction of the trainer condition, both groups demonstrated a predictable reduction in challenging behavior. The mean was 10.7% for time-out and 1.5% for FCT following intervention. In the naive trainer phases following intervention, the mean was 52.7% for time-out and 2.6% for FCT. Thus, the challenging behavior of the time-out group returned to approximately baseline levels, whereas the behavior of the FCT group was maintained at postintervention levels. Following the introduction of FCT training for the time-out group, their mean percentage of challenging behavior fell to 9.9% (see Figures 5 and 6).

Discussion

The results of Study 3 demonstrated that with a person unaware of intervention histories, children who have been treated with a time-out procedure revert to baseline levels of challenging behavior. On the other hand, children who have received training in FCT maintained their use of appropriate attention-getting phrases and showed postintervention levels of challenging behavior.

These findings supported previous explanations for the effectiveness of FCT (Durand, 1990; Durand & Carr, 1991). Children from this group were given an alternative attention-getting behavior that was responded to consistently by naive trainers. Possessing this alternate form of attention-getting behavior obviated the need to gain attention through challenging behavior.

Because the trainers in the naive trainer condition were unaware of the intervention histories, an alternative explanation for FCT may be discounted. For example, it could be argued that during FCT, trainers, in addition to providing attention for the students' requests for attention, somehow interacted with the students in a way that was different from baseline (e.g., provided more attention at other

times, provided fewer demands, etc.). However, because these trainers were uninformed of our intervention, this explanation loses support. Finally, the success of FCT with the time-out group argues against any intergroup differences that may have accounted for the results.

GENERAL DISCUSSION

The effectiveness of time-out can be attributed to the removal of the consequence that presumably maintains the challenging behavior (i.e., social attention). When this contingency was changed in the presence of the naive trainer, the challenging behaviors predictably returned to previous levels. It could be argued that the naive trainer condition resembled many of the situations in which students are placed each day. With the turnover of staff typically experienced in programs for persons with disabilities, and with the increasing introduction of community members (e.g., librarians, fast-food restaurant workers), students are frequently faced with people who are untrained in behavior analysis. As Study 3 demonstrated, without formal training of these persons, the results from time-out cannot be maintained.

In contrast, the students who received FCT used their attention-getting phrases, and these were appropriately responded to by the naive trainers. No training of these trainers was required. Instead, trainers responded with attention when recruited by the students. This portion of the study systematically replicated work described previously involving the recruitment of natural communities of reinforcement (e.g., Stokes et al., 1978). Teaching students to recruit the stimuli maintaining their challenging behavior in a more appropriate manner may not only reduce these problem behaviors initially but may also facilitate maintenance.

One potential limitation of the present research was the use of trained undergraduates in the naive trainer condition instead of the students' regular teachers. We chose undergraduate students as trainers for several reasons. First, by using this group we could be more confident that they were unaware of the interventions being used. The classroom

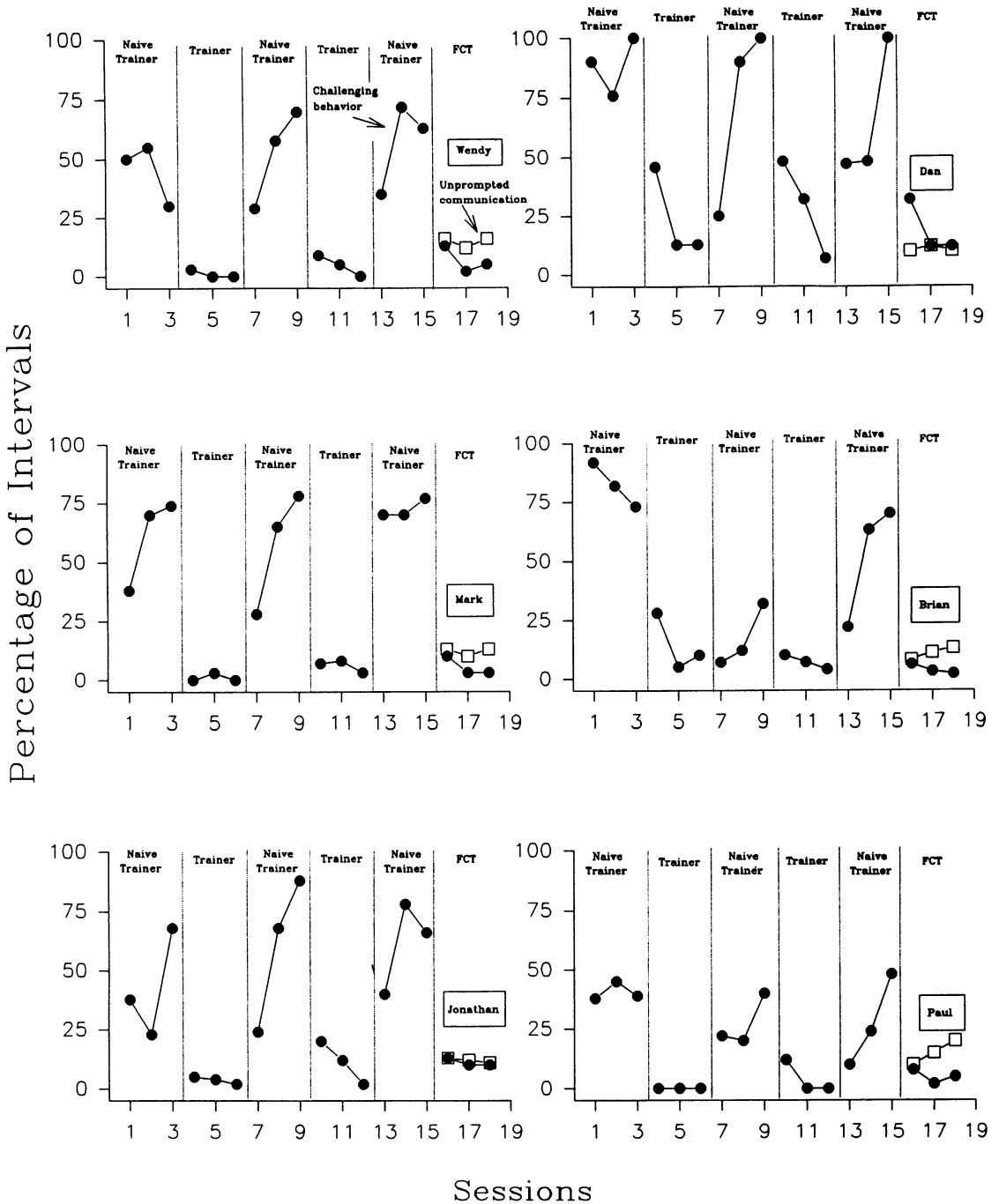


Figure 5. Challenging behavior and unprompted communication for each of the participants in the time-out group as a function of the naive trainer, trainer, and FCT manipulations in Study 3.

teachers had access to aspects of the study that may have informed them of the interventions used with each participant. Second, we have previously shown that the effects of FCT can transfer to students'

classroom teachers (Durand & Carr, 1991). Finally, using this group of trained undergraduates allowed us to keep relatively constant the students' previous teaching histories. None of the undergraduate train-

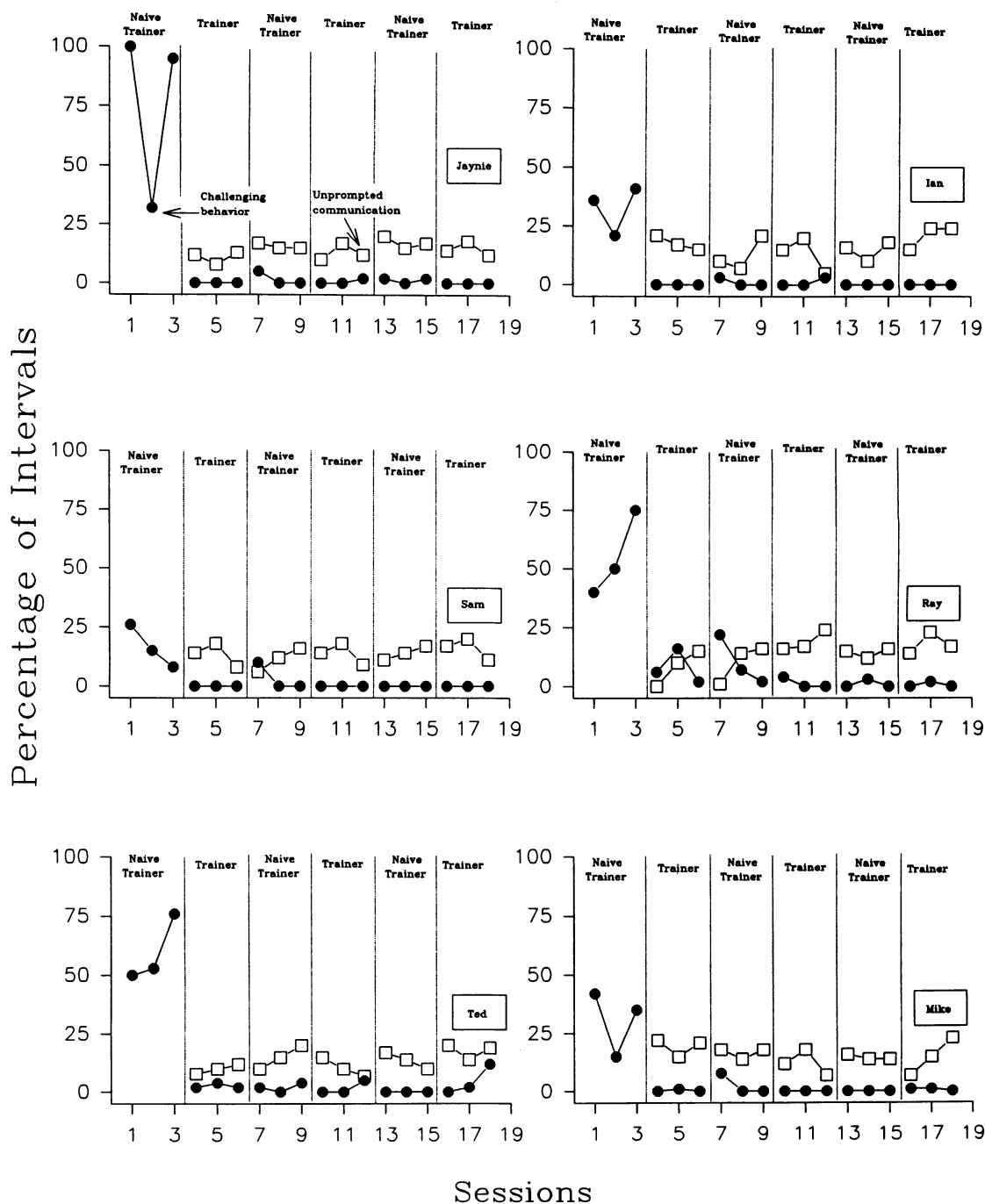


Figure 6. Challenging behavior and unprompted communication for each of the participants of the FCT group as a function of the naive trainer and trainer manipulations in Study 3.

ers had previously served as trainers for these children. The present study was designed to investigate one class of challenging behaviors (those maintained

by social attention). Other challenging behaviors, however, have been shown to be maintained by variables such as escape from aversive situations (Carr, Newsom, & Binkoff, 1976). Future work

should focus on analyzing differential treatment effectiveness with other classes of behaviors. Is escape extinction (i.e., preventing a child from escaping the aversive stimulus), for instance, comparable to FCT for escape-motivated behaviors? Such issues are important for addressing both theoretical and practical questions.

One issue that arises from this investigation concerns the effectiveness of such a brief (10 s) time-out procedure. Other investigations of time-out have used longer periods for the removal of attention (e.g., White, Nielsen, & Johnson, 1972) as well as more intrusive and supposedly more aversive parameters (e.g., removing the child to a locked, empty room). However, these more intrusive interventions have not always been successful (e.g., Risley, 1968). Two differences in this investigation may have contributed to the effectiveness of time-out. First, the time-in environment was highly positive, stable, and predictable for each child. Each participant was exposed to a number of sessions in which praise was administered every 30 s. Any change in this procedure was probably very salient and thereby facilitated the effectiveness of time-out.

Perhaps a more important difference between the present study and previous investigations may be the functional assessment (Study 1). Children were screened prior to treatment on the basis of the presumed maintaining variable (social attention). This type of analysis, prior to treatment, is often absent in the intervention literature. Few studies have explicitly demonstrated the effectiveness of time-out with behaviors shown to be maintained by adult attention per se. Previous failure with time-out may be attributable to the inclusion of participants whose behaviors were maintained by other variables.

An area for future research involves the assessment of the effectiveness of this type of intervention directly in community settings. Will community members unfamiliar with behavior analysis respond appropriately to the communicative attempts made by these students, and will the challenging behaviors exhibited by these students be reduced? This appears to be a logical next step in developing positive supports for students with challenging behavior.

REFERENCES

- Baer, D. M., & Wolf, M. M. (1970). The entry into natural communities of reinforcement. In R. Ulrich, T. Stachnik, & J. Mabry (Eds.), *Control of human behavior: From cure to prevention* (Vol. 2, pp. 319-324). Glenview, IL: Scott, Foresman.
- Barlow, D. H., & Hersen, M. (1984). *Single case experimental designs* (2nd ed.). New York: Pergamon Press.
- Bird, F., Dores, P. A., Moniz, D., & Robinson, J. (1989). Reducing severe aggressive and self-injurious behaviors with functional communication training: Direct, collateral and generalized results. *American Journal of Mental Retardation*, *94*, 37-48.
- Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, *18*, 111-126.
- Carr, E. G., & Kemp, D. C. (1989). Functional equivalence of autistic leading and communicative pointing: Analysis and treatment. *Journal of Autism and Developmental Disorders*, *19*, 561-578.
- Carr, E. G., Newsom, C. D., & Binkoff, J. A. (1976). Stimulus control of self-destructive behavior in a psychotic child. *Journal of Abnormal Child Psychology*, *4*, 139-153.
- Carr, E. G., Robinson, S., & Palumbo, L. W. (1990). The wrong issue: Aversive versus nonaversive treatment. The right issue: Functional versus nonfunctional treatment. In A. C. Repp & N. N. Singh (Eds.), *Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 361-379). Sycamore, IL: Sycamore.
- Doss, S., & Reichle, J. (1989). Establishing communicative alternatives to the emission of socially motivated excess behavior: A review. *Journal of the Association for Persons with Severe Handicaps*, *14*, 101-112.
- Durand, V. M. (1987). "Look Homeward Angel": A call to return to our (functional) roots. *The Behavior Analyst*, *10*, 299-302.
- Durand, V. M. (1990). *Severe behavior problems: A functional communication training approach*. New York: Guilford.
- Durand, V. M., & Carr, E. G. (1987). Social influences on "self-stimulatory" behavior: Analysis and treatment application. *Journal of Applied Behavior Analysis*, *20*, 119-132.
- Durand, V. M., & Carr, E. G. (1991). Functional communication training to reduce challenging behavior: Maintenance and application in new settings. *Journal of Applied Behavior Analysis*, *24*, 251-264.
- Durand, V. M., & Crimmins, D. B. (1987). Assessment and treatment of psychotic speech in an autistic child. *Journal of Autism and Developmental Disorders*, *17*, 17-28.
- Durand, V. M., & Crimmins, D. B. (1992). *The Motivation Assessment Scale*. Topeka, KS: Monaco & Associates.
- Durand, V. M., & Kishi, G. (1987). Reducing severe behavior problems among persons with dual sensory impairments: An evaluation of a technical assistance model.

- Journal of the Association for Persons with Severe Handicaps*, **12**, 2-10.
- Gaylord-Ross, R. J., Weeks, M., & Lipner, C. (1980). An analysis of antecedent, response, and consequence events in the treatment of self-injurious behavior. In W. Sailor, B. Wilcox, & L. Brown (Eds.), *Methods of instruction for severely handicapped students* (pp. 135-157). Baltimore: Paul H. Brookes.
- Gesell, A. (1949). *Gesell developmental schedules*. New York: Psychological Corp.
- Harris, S. L., & Ersner-Hershfield, R. (1978). Behavioral suppression of seriously disruptive behavior in psychotic and retarded patients: A review of punishment and its alternatives. *Psychological Bulletin*, **85**, 1352-1375.
- Horner, R. H., & Budd, C. M. (1985). Acquisition of manual sign use: Collateral reduction of maladaptive behavior, and factors limiting generalization. *Education and Training of the Mentally Retarded*, **20**, 39-47.
- Horner, R. H., Sprague, J. R., O'Brien, M., & Heathfield, L. T. (1990). The role of response efficiency in the reduction of problem behaviors through functional equivalence training: A case study. *Journal of the Association for Persons with Severe Handicaps*, **15**, 91-97.
- Hunt, P., Alwell, M., Goetz, L., & Sailor, W. (1990). Generalized effects of conversation skill training. *Journal of the Association for Persons with Severe Handicaps*, **15**, 250-260.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, **2**, 1-20.
- Leiter, R. G. (1969). *The Leiter International Performance Scale*. Chicago: Stoelting.
- Mace, F. C., & Lalli, J. S. (1991). Linking descriptive and experimental analyses in the treatment of bizarre speech. *Journal of Applied Behavior Analysis*, **24**, 553-562.
- Meyer, L. H., Evans, I. M., Wuerch, B. B., & Brennan, J. M. (1985). Monitoring the collateral effects of leisure skill instruction: A case study in multiple baseline methodology. *Behavior Research and Therapy*, **23**, 127-138.
- Parrish, J. M., Cataldo, M. F., Kolko, D. J., Neef, N. A., & Egel, A. L. (1986). Experimental analysis of response covariation among compliant and inappropriate behaviors. *Journal of Applied Behavior Analysis*, **19**, 241-254.
- Risley, T. (1968). The effects and side effects of punishing the autistic behaviors of a deviant child. *Journal of Applied Behavior Analysis*, **1**, 21-34.
- Stokes, T. F., Fowler, S. A., & Baer, D. M. (1978). Training preschool children to recruit natural communities of reinforcement. *Journal of Applied Behavior Analysis*, **11**, 285-303.
- Terman, L. M., & Merrill, M. A. (1973). *Stanford-Binet Intelligence Scale, Form L-M*. Boston: Houghton Mifflin.
- Touchette, P. E., MacDonald, R. F., & Langer, S. N. (1985). A scatter plot for identifying stimulus control of problem behavior. *Journal of Applied Behavior Analysis*, **18**, 343-351.
- Wacker, D. P., Steege, M. W., Northup, J., Sasso, G., Berg, W., Reimers, T., Cooper, L., Cigrand, K., & Donn, L. (1990). A component analysis of functional communication training across three topographies of severe behavior problems. *Journal of Applied Behavior Analysis*, **23**, 417-429.
- White, G. D., Nielsen, G., & Johnson, S. M. (1972). Timeout duration and the suppression of deviant behavior in children. *Journal of Applied Behavior Analysis*, **5**, 111-120.

Received August 11, 1991

Initial editorial decision October 15, 1991

Revision received March 17, 1992

Final acceptance August 25, 1992

Action Editor, David P. Wacker